

Application Serial No.: 09/867,402
Reply to Office Action dated January 29, 2003

AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all prior versions, and listing, of claims in the application:

Listing of Claims:

1. (Currently Amended) A laser diode module comprising:

a laser diode;

an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;

an optical system mounting member configured to support at least a portion of said optical system;

a laser diode mounting member configured to support said laser diode, said optical system mounting member being attached to said laser diode mounting member;

a bottom plate configured to support said laser diode, said optical system, said optical system mounting member, and said laser diode mounting member; and

a temperature control device thermally connected to said laser diode by said laser diode mounting member, said temperature control device being attached to said bottom plate,

wherein said optical system mounting member is not in direct contact with said temperature control device.

2. (Canceled)

3. (Previously Presented) The laser diode module according to Claim 1, wherein said temperature control device is a thermo module, said thermo module having a first plate

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member attached to said laser diode mounting member, a second plate member attached to said bottom plate, and a peltier element positioned between said first plate member and said second plate member.

4. (Currently Amended) ~~A~~ The laser diode module according to Claim 3,
comprising:

- ~~a laser diode;~~
- ~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~
- ~~an optical system mounting member configured to support at least a portion of said optical system;~~
- ~~a laser diode mounting member configured to support said laser diode, said optical system mounting member being attached to said laser diode mounting member;~~
- ~~a bottom plate configured to support said laser diode, said optical system, said optical system mounting member, and said laser diode mounting member; and~~
- ~~a temperature control device thermally connected to said laser diode by said laser diode mounting member, said temperature control device being attached to said bottom plate,~~
- ~~wherein said temperature control device is a thermo module, said thermo module having a first plate member attached to said laser diode mounting member, a second plate member attached to said bottom plate, and a peltier element positioned between said first plate member and said second plate member; and~~
- ~~wherein said laser diode mounting member is formed of material having a linear expansion coefficient in a range between a linear expansion coefficient of said optical system~~

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mounting member and a linear expansion coefficient of said first plate member of said thermo module.

5. (Currently Amended) ~~A~~ The laser diode module according to Claim 3,
comprising:

- ~~a laser diode;~~
- ~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~
- ~~an optical system mounting member configured to support at least a portion of said optical system;~~
- ~~a laser diode mounting member configured to support said laser diode, said optical system mounting member being attached to said laser diode mounting member;~~
- ~~a bottom plate configured to support said laser diode, said optical system, said optical system mounting member, and said laser diode mounting member; and~~
- ~~a temperature control device thermally connected to said laser diode by said laser diode mounting member, said temperature control device being attached to said bottom plate,~~
- ~~wherein said temperature control device is a thermo module, said thermo module having a first plate member attached to said laser diode mounting member, a second plate member attached to said bottom plate, and a peltier element positioned between said first plate member and said second plate member, and~~

wherein said optical system mounting member has a thermal conductivity lower than a thermal conductivity of said laser diode mounting member [and said first plate member of said thermo module].

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6. (Original) The laser diode module according to Claim 3, wherein said first plate member is made of aluminum oxide.

7. (Original) The laser diode module according to Claim 1, wherein said optical fiber has a portion contained within a holder, and wherein said optical system mounting member comprises a holder mounting member attached to said holder.

8. (Original) The laser diode module according to Claim 1, wherein said laser diode mounting member is made of copper tungsten 10.

9. (Original) The laser diode module according to Claim 1, wherein said optical system mounting member is made of an Fe-Ni-Co alloy.

10. (Original) The laser diode module according to Claim 1, wherein said laser diode is mounted on a laser diode bonding portion, said laser diode bonding portion being mounted on said laser diode mounting member.

11. (Original) The laser diode module according to Claim 1, wherein said lens portion is a discrete lens supported by said optical system mounting member.

12. (Original) The laser diode module according to Claim 11, wherein:
said optical system further comprises an optical isolator supported by said optical system mounting member; and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens and said optical isolator to said optical fiber along said optical axis.

13. (Original) The laser diode module according to Claim 12, wherein:
said discrete lens is connected to a holder; and

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said optical system mounting member comprises a holder mounting member supporting said holder.

14. (Original) The laser diode module according to Claim 13, wherein said optical isolator is mounted to said holder mounting member.

15. (Original) The laser diode module according to Claim 12, wherein said optical fiber is supported by said bottom plate.

16. (Original) The laser diode module according to Claim 15, wherein:

said optical system further comprises a second lens supported by said bottom plate;

and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens, said optical isolator, and said second lens to said optical fiber along said optical axis.

17. (Original) The laser diode module according to Claim 16, further comprising a package including said bottom plate, said package being configured to support said second lens and said optical fiber.

18. (Canceled)

19. (Original) The laser diode module according to Claim 11, wherein said laser diode mounting member is fixed on said bottom plate via a thermo module.

20. (Currently Amended) ~~A~~ The laser diode module according to Claim 1,
~~comprising:~~

~~a laser diode;~~

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~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~

~~an optical system mounting member configured to support at least a portion of said optical system;~~

~~a laser diode mounting member configured to support said laser diode, said optical system mounting member being attached to said laser diode mounting member; and~~

~~a bottom plate configured to support said laser diode, said optical system, said optical system mounting member, and said laser diode mounting member, wherein:~~

~~said laser diode mounting member is made of a material having a thermal conductivity of at least 150 W/mK; and~~

~~said optical system mounting member is made of a material having a thermal conductivity of at most 50 W/mK.~~

21. (Currently Amended) ~~A~~ The laser diode module according to Claim 1,
~~comprising:~~

~~a laser diode;~~

~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~

~~an optical system mounting member configured to support at least a portion of said optical system;~~

~~a laser diode mounting member configured to support said laser diode, said optical system mounting member being attached to said laser diode mounting member; and~~

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~~a bottom plate configured to support said laser diode, said optical system, said optical system mounting member, and said laser diode mounting member,~~

wherein said optical system mounting member is made of a material having a Young's modulus of at least $15 \times 10^3 \text{ kg/mm}^2$.

22. (Original) The laser diode module according to Claim 1, wherein said optical system mounting member is made of a material that is substantially non-magnetic.

23. (Currently Amended) A semiconductor laser diode module comprising:
a laser diode;

an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;

a fastening means for supporting at least a portion of said optical system;

a base configured to support said fastening means and said laser diode;

a bottom plate configured to support said laser diode, said optical system, said fastening means, and said base, wherein said base includes a laser diode mounting member and a fastening means mounting member, said laser diode mounting member having a laser diode mounting region configured to mount said laser diode, said fastening means mounting member being mounted to said laser diode mounting member at a position other than said laser diode mounting region; and

a temperature control device thermally connected to said laser diode by said laser diode mounting member, said temperature control device being attached to said bottom plate,

wherein said fastening means mounting member is not in direct contact with said temperature control device.

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24. (Currently Amended) ~~A~~ The semiconductor laser diode module according to Claim 23, comprising:

~~a laser diode;~~

~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~

~~a fastening means for supporting at least a portion of said optical system;~~

~~a base configured to support said fastening means and said laser diode; and~~

~~a bottom plate configured to support said laser diode, said optical system, said fastening means, and said base;~~

~~wherein said base includes a laser diode mounting member and a fastening means mounting member, said laser diode mounting member having a laser diode mounting region configured to mount said laser diode, said fastening means mounting member being mounted to said laser diode mounting member at a position other than said laser diode mounting region, and further comprising wherein said temperature control device comprises:~~

~~a thermo module mounted on said bottom plate, said thermo module having a base side plate member on which said base is mounted, wherein said laser diode mounting member is formed of a material having a linear expansion coefficient in a range between a linear expansion coefficient of said fastening means mounting member and a linear expansion coefficient of said base side plate member of said thermo module.~~

25. (Currently Amended) The semiconductor laser diode module according to Claim 24, wherein said fastening means mounting member has a thermal conductivity lower than a

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thermal conductivity of said laser diode mounting member [and said base side plate member of said thermo module].

26. (Original) The semiconductor laser diode module according to Claim 24, further comprising a package including said bottom plate, said package being configured to accommodate therein said laser diode, said optical system, said fastening means, said base, and said thermo module.

27. (Original) The semiconductor laser diode module according to Claim 24, wherein said thermo module further includes a bottom plate side plate member and a peltier element positioned between said base side plate member and said bottom plate side plate member.

28. (Original) The semiconductor laser diode module according to Claim 24, wherein said base projects in a direction parallel to an optical axis of said optical system from an end portion on an optical fiber mounting side of said thermo module.

29. (Original) The semiconductor laser diode module according to Claim 28, wherein said fastening means mounting member projects in a direction parallel to said optical axis from an end portion on an optical fiber mounting side of said laser diode mounting member.

30. (Original) The semiconductor laser diode module according to Claim 29, wherein said laser diode mounting member has a reinforcement portion for mechanically reinforcing said fastening means located at a position closest to said laser diode, and wherein said reinforcement portion has a lower surface that is out of contact with said thermo module.

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31. (Original) The semiconductor laser diode module according to Claim 23, wherein said lens portion has a fiber lens formed on said optical fiber, and wherein said fiber lens has a tip end side arranged to oppose a light emitting facet of said laser diode.

32. (Currently Amended) A The semiconductor laser diode module according to Claim 31, comprising:

~~a laser diode;~~

~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~

~~a fastening means for supporting at least a portion of said optical system;~~

~~a base configured to support said fastening means and said laser diode; and~~

~~a bottom plate configured to support said laser diode, said optical system, said fastening means, and said base;~~

~~wherein said base includes a laser diode mounting member and a fastening means mounting member, said laser diode mounting member having a laser diode mounting region configured to mount said laser diode, said fastening means mounting member being mounted to said laser diode mounting member at a position other than said laser diode mounting region, wherein said lens portion has a fiber lens formed on said optical fiber, wherein said fiber lens has a tip end side arranged to oppose a light emitting facet of said laser diode, and wherein said fiber lens is an anamorphic lens.~~

33. (Original) The semiconductor laser diode module according to Claim 23, wherein said fastening means is made of an Fe-Ni-Co alloy.

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34. (Original) The semiconductor laser diode module according to Claim 23, wherein said fastening means mounting member is made of an Fe-Ni-Co alloy.

35. (Original) The semiconductor laser diode module according to Claim 23, wherein said lens portion is a discrete lens supported by said fastening means.

36. (Original) The semiconductor laser diode module according to Claim 35, wherein:

said optical system further comprises an optical isolator supported by said fastening means mounting member;

said optical system further comprises a second lens supported by said bottom plate; and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens, said optical isolator, and said second lens to said optical fiber along said optical axis.

37. (Original) The semiconductor laser diode module according to Claim 36, further comprising a package including said bottom plate, said package being configured to support said second lens and said optical fiber.

38. (Canceled)

39. (Original) The semiconductor laser diode module according to Claim 23, wherein said laser diode mounting member is fixed on said bottom plate via a thermo module.

40. (Currently Amended) ~~A~~ The semiconductor laser diode module according to Claim 23, comprising:
a laser diode;

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~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~

~~a fastening means for supporting at least a portion of said optical system;~~

~~a base configured to support said fastening means and said laser diode; and~~

~~a bottom plate configured to support said laser diode, said optical system, said fastening means, and said base,~~

~~wherein said base includes a laser diode mounting member and a fastening means mounting member, said laser diode mounting member having a laser diode mounting region configured to mount said laser diode, said fastening means mounting member being mounted to said laser diode mounting member at a position other than said laser diode mounting region, and wherein:~~

~~said laser diode mounting member is made of a material having a thermal conductivity of at least 150 W/mK; and~~

~~said fastening means mounting member is made of a material having a thermal conductivity of at most 50 W/mK.~~

41. (Currently Amended) ~~A~~ The semiconductor laser diode module according to Claim 23, comprising:

~~a laser diode;~~

~~an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;~~

~~a fastening means for supporting at least a portion of said optical system;~~

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~~a base configured to support said fastening means and said laser diode; and~~
~~a bottom plate configured to support said laser diode, said optical system, said~~
~~fastening means, and said base,~~
~~wherein said base includes a laser diode mounting member and a fastening means~~
~~mounting member, said laser diode mounting member having a laser diode mounting region~~
~~configured to mount said laser diode, said fastening means mounting member being mounted~~
~~to said laser diode mounting member at a position other than said laser diode mounting~~
~~region, and wherein said fastening means mounting member is made of a material having a~~
~~Young's modulus of at least 15×10^3 kg/mm².~~

42. (Original) The semiconductor laser diode module according to Claim 23,
wherein said fastening means mounting member is made of a material that is substantially
non-magnetic.